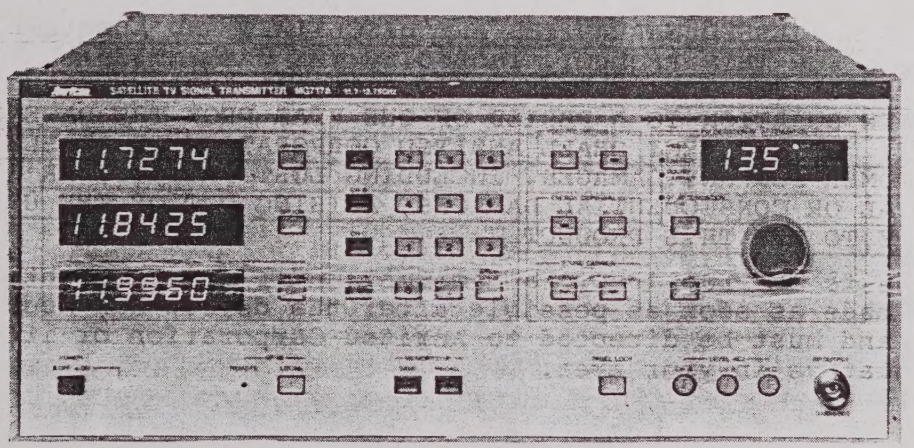
OPERATION MANUAL

SATELLITE TV SIGNAL TRANSMITTER

MG646A/C

MG717A/C



ANRITSU CORP.

MP MASTER
MA25495

SECTION 1

GENERAL

1.1 Purpose and Use

The MG646A/C and MG717A/C are signal transmitters which output main carrier signals for satellite broadcasting.

These signals are FM-modulated by video signals and sound subcarriers.

The MG646A and MG717A can simultaneously output in different channels with independently set frequencies. (MG646C and MG717C waves: one channel each.)

The MG646A/C output in the 1 GHz band for IF, and can also be used for 12 GHz band direct broadcasting satellite (DBS) and for a DBS tuner of a block-down system of 4 GHz bands. Another use is in the development, manufacture, and inspection of shared receiving equipment.

The MG717A/C outputs in the 12 GHz band for RF and can be used for a 12 GHz band DBS converter and for the overall development, manufacture, and inspection of a DBS converter plus tuner.

Since these signal transmitters are incorporated with a general purpose interface bus (GP-IB) as a standard equipment, an automatic measuring system can easily be configured by connecting them with a personal computer.

SECTION 2

COMPOSITION AND SPECIFICATIONS

2.1 Composition

2.1.1 Types of signal transmitters

The four types of signal transmitters are listed in Table 2-1.

Table 2-1 Types of signal transmitters

	Output frequency band	Number of output channels
MG646A	0.9 to 1.7 GHz	3 CH
MG646C	0.9 to 1.7 GHz	1 CH
MG717A	11.7 to 12.75 GHz	3 CH
MG717C	11.7 to 12.75 GHz	1 CH

2.1.2 Composition

Table 2-2 Composition

Item	No.	Name	Q'ty
Instrument	1.	MG646A, MG646C, MG717A or MG717C SATELLITE TV SIGNAL TRANSMITTER	1
Accessories	2.	Instruction manual	1
	3.	Power cord	1
	4.	Fuse	One set

2.1.3 Mainframe options

Table 2-3 lists options available so the MG646A/C and MG717A/C may be used more efficiently. These options have an extra cost.

Table 2-3 Options

No.	Function
01	Subcarrier for sound FM (The subcarrier frequency is a frequency specified from the 4.5 to 8 MHz range, and the pre-emphasis is 50 μs, 75 μs, whichever is specified.)
02	Output attenuator (0 to 70 dB in 1 dB steps and 3 CH shared)

2.2 Specifications

Table 2-4 MG646A/C Specifications

Number of output channels		MG646A: 3 CH (Simultaneous output permitted) MG646C: 1 CH
Output frequency	Setting range	0.9GHz to 1.7GHz
	Setting resolution	100kHz
	Accuracy	Less than ±100kHZ
Output level		-20dBm/CH
Output sprious		Less than -55dBc/0.9GHz to 1.7GHz, Less than -30dBc/out of 0.9GHz to 1.7GHz
Differential gain (DG)		Less than 2%/±13.5MHz (fm 4.43MHz)
Differential phase (DP)		Less than 2°/±13.5MHz (fm 4.43MHz)

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Table 2-4 MG646A/C Specifications (Cont'd)

Waveform distortion	$\frac{\text{Field-time}}{\text{Line-time}}$	Less than 2%
Video signal S/N		Above 60dB
FM frequency deviation	Video	1.0MHz to 25.0MHz p-p (Input level: 1Vp-p/75Ω)
	Energy dispersal	0.5MHz to 2.0MHz p-p
	Sound subcarrier	1.0MHz to 8.0MHz p-p (input level 0dBm/75Ω)
	Display accuracy	Less than ±(indication value x0.05 +200kHz)
Video	Amplitude	Less than ±0.5dB/50Hz to 8MHz, Less than +0.5dB to -1.5dB/8MHz to 10MHz
	Pre-emphasis	CCIR Rec. 405-1 curve A (525 lines), curve B (625 lines) and OFF
Energy dispersal		30/25Hz and 15/12.5Hz synchronized to vertical synchronous signal and OFF
Sound FM-modulation (option 01)	Subcarrier	One arbitrary frequency of 4.5MHz to 8.5MHz
	Subcarrier frequency accuracy	Less than ±2kHz
	Subcarrier frequency deviation	150kHz (p-p) (input level: 0dBm/600Ω)
	Deviation accuracy	Less than ±5%
	Pre-emphasis	50μs or 75μs, and OFF
	Frequency deviation due to a subcarrier	1.0MHz to 8.0MHz p-p
Output attenuator (option 02)	Attenuation	0 to 70dB in 1dB steps (3 CH Common)
	Attenuation accuracy	Less than ±0.4dB/1 to 4dB,±0.7dB/5 to 10dB,±0.9dB/11 to 30dB,±1.2dB/31 to 70dB

Table 2-4 MG646A/C Specifications (Cont'd)

Input connector	Video	BNC, MG646A: 3 pieces (1/CH) MG646C: 1 piece
	Sound subcarrier	BNC, MG646A: 3 pieces (1/CH) MG646C: 1 piece
	Sound (option 01)	XLR, MG646A: 3 pieces (1/CH) MG646C: 1 piece
Output connector		N-type, 1 piece
	Impedance	50Ω
Function setting memory		Can save and recall 9 different function setting states
External control		GP-IB (IEEE 488, IEC 625-1, 24 pins) Controls all front panel functions except the power supply switch and level calibration knob.
Power supply		AC**V ±10%, 50/60Hz
Dimensions		177H, 426W, 451Dmm

Table 2-5 MG717A/C Specifications

Number of output channels		MG717A: 3 CH (Simultaneous output permitted) MG717C: 1 CH
Output frequency	Setting range	11.7GHz to 12.75GHz
	Setting resolution	100kHz
	Accuracy	Less than ±100kHz
Output level		-30dBm/CH
Output sprious		Less than -55dBc/11.7GHz to 12.75GHz, Less than -30dBc/out of 11.7GHz to 12.75GHz

Table 2-5 MG717A/C Specifications (Cont'd)

Differential gain (DG)		Less than 2%/±13.5MHz (fm 4.43MHz)
Differential phase (DP)		Less than 2°/±13.5MHz (fm 4.43MHz)
Waveform distortion $\frac{\text{Field Time}}{\text{Line Time}}$		Less than 2%
Video signal S/N		Above 60dB
FM frequency deviation	Video	1.0MHz to 25.0MHz p-p (Input level: 1Vp-p/75Ω)
	Energy dispersal	0.5MHz to 2.0MHz p-p
	Sound subcarrier	1.0MHz to 8.0MHz p-p (input level 0dBm/75Ω)
	Display accuracy	Less than ±(indication value x0.05 +200kHz)
Video	Amplitude	Less than ±0.5dB/50Hz to 8MHz, Less than +0.5dB to -1.5dB/8MHz to 10MHz
	Pre-emphasis	CCIR Rec. 405-1 curve A (525 lines), curve B (625 lines) and OFF
Energy dispersal		30/25Hz and 15/12.5Hz synchronized to vertical synchronous signal and OFF
Sound FM-modulation (option 01)	Subcarrier	One arbitrary frequency of 4.5MHz to 8.5MHz
	Subcarrier frequency accuracy	Less than ±2kHz
	Subcarrier frequency deviation	150kHz p-p (input level: 0dBm/600Ω)
	Deviation accuracy	Less than ±5%
	Pre-emphasis	50μs or 75μs and OFF
	Frequency deviation due to a subcarrier	1.0MHz to 8.0MHz p-p

Table 2-5 MG717A/C Specifications (Cont'd)

Output attenuator (option 02)	Attenuation	0 to 70dB in 1dB steps (3 CH Common)
	Attenuation accuracy	Less than ±0.4dB/1 to 4dB, ±0.7dB/5 to 10dB, ±0.9dB/11 to 30dB, ±1.2dB/31 to 70dB
Input connector	Video	BNC, MG717A: 3 pieces (1/CH) MG717C: 1 piece
	Sound subcarrier	BNC, MG717A: 3 pieces (1/CH) MG717C: 1 piece
	Sound (option 01)	XLR, MG717A: 3 pieces (1/CH) MG717C: 1 piece
Output connector		N-type, 1 piece
	Impedance	50Ω
Function setting memory		Can save and recall 9 different function setting states
External control		GP-IB (IEEE 488, IEC 625-1, 24 pins) Controls all front panel functions except the power supply switch and level calibration knob.
Power supply		AC**V ±10%, 50/60Hz
Dimensions		177H, 426W, 451Dmm

2.3 Optional Accessories

Table 2-6 lists optional accessories available so the MG646A/C and MG717A/C may be used more efficiently. These options have an extra cost.

Table 2-6 Optional Accessories

Name	Main specifications	For MG717A/C	For MG646A/C
Coaxial directional couplers	8.6 to 15.0GHz, 16dB, N-J	O	
Coaxial directional couplers	1.0 to 4.0GHz, 10dB, N-J		O
Coaxial waveguide converter	10.0 to 15.0GHz, N-J•BRJ120	O	
DC feed	F-P•F-J	O	
DC block			O
50Ω to 75Ω impedance converter	N-P•F-J	O	O
75Ω terminator	BNC-J•BNC-P	O	O
Coaxial adapter	N-P•N-P	O	O
Coaxial cord	N-P•N-P, 1 m	O	
Coaxial cord			O

SECTION 3

OPERATION

3.1 Precautions on Operation

<Power supply>

The MG646A/C and MG717A/C operate on a +10% to -10%, 50/60 Hz power supply of the AC voltage indicated on the rear panel. (AC**V, See Note at the biginning of this manual.)

DANGER

To avoid electrical shocks, be sure to ground the terminal on the rear panel or ground the ground terminal of the power cord.

<Environmental Conditions of the installation site>

The MG646A/C and MG717A/C operate normally between 0 to 50°C. However, avoid using them in the following places.

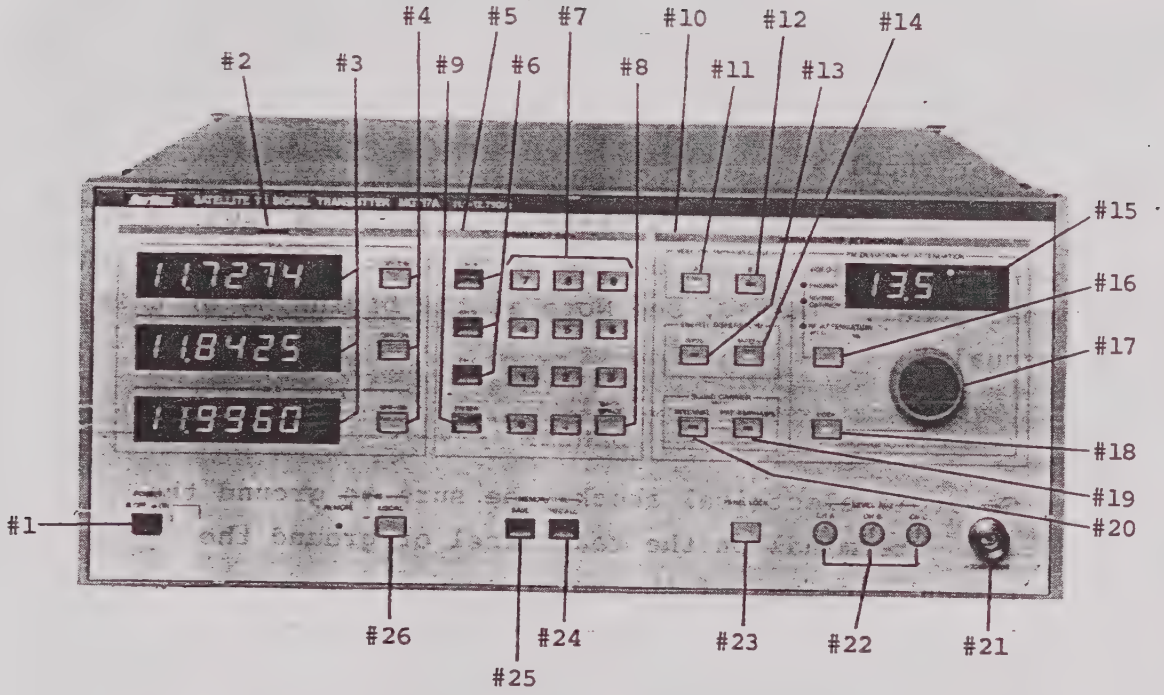
a. Where there are strong vibrations
b. Where there is high humidity and dust
c. In direct sunlight
d. Where they may be subject to noxious gases

NOTE

After the MG646A/C and MG717A are used in low temperature (0°C) for an extended period of time, and they are used again at room temperature, water condensation may cause short circuit.

When condensation is foreseen, through dry the equipment before turning the power on.

3.2 Front and Rear Panels



Note: The MG646C and MG717C are not equipped with the CH B and CH C parts in #3, #4, #6 and #22.

Fig. 3-1 Front panel

Block name	Operation part		Description
	POWER	#1	Power supply switch. When the power is switched ON, the panel status is reset.
CHANNEL	#2		Selects and displays the output channel.
	Frequency indicator LED	#3	Indicates the output frequency of each channel and whether or not there is output. (When the lamp is not ON, the output is OFF.)
	Output OFF/ON	#4	Switches the output of each channel OFF/ON.

(cont.)

Block name	Operation part	Description
FREQUENCY DATA #5		Used for setting the output frequency.
	CH A, CH B, CH C #6	Selects the channel key whose output frequency is to be set.
	Numeric keys #7	Used to input the output frequency and memory addresses #24 and #25.
	BACK SPACE #8	Used to correct numeric input. Whenever the key is pressed, one character is erased, starting from the last one entered.
	ENTER #9	Pressed after numeric key #7 is input.
MODULATION/ ATTENUATION #10		Used to set the modulation condition and output attenuator.
	VIDEO PRE-EMPHASIS CURVE A #11	Selects the curve A (525 lines) video pre-emphasis.
	VIDEO PRE-EMPHASIS CURVE B #12	Selects the curve B (625 lines) video pre-emphasis.
	ENERGY DISPERSAL 30/25 #13	Selects the energy dispersal frequency to a half of the video vertical synchronous frequency.
	ENERGY DISPERSAL 15/12.5 #14	Selects the energy dispersal frequency to one fourth of the video vertical synchronous frequency.
	FM DEVIATION/ ATTENUATION indicator LED #15	Displays the frequency deviation and the attenuator value.
	FM DEVIATION/ ATTENUATION key #16	Selects the display item for indicator LED #15. - Video - Energy dispersal - Sound subcarrier - Output attenuator (option 02)

(cont.)

Block name	Operation part	Description
MODULATION/ ATTENUATION (cont.) #10	FM DEVIATION/ ATTENUATION data knob #17	Sets the frequency deviation and the output attenuator value.
	LOCK #18	Makes data knob #17 ineffective.
	SOUND CARRIER INTERNAL #19	Operates the sound subcarrier for the built-in FM-modulation. (Option 01)
	SOUND CARRIER PRE-EMPHASIS #20	Switches the build-in sound subcarrier pre-emphasis OFF/ON. (Option 01)
	OUTPUT #21	The main carrier output connector for 1 GHz band (MG646A/C) or 12 GHz band (MG717A/C).
	LEVEL ADJ #22	Makes fine adjustments of the output level for each channel.
	PANEL LOCK #23	Makes all keys ineffective.
	MEMORY RECALL #24	Reads the stored panel set status and reset the panel set status.
	MEMORY SAVE #25	Stores up to 9 different panel setting states.
	LOCAL #26	Changes the remote to the local state when GP-IB is used.

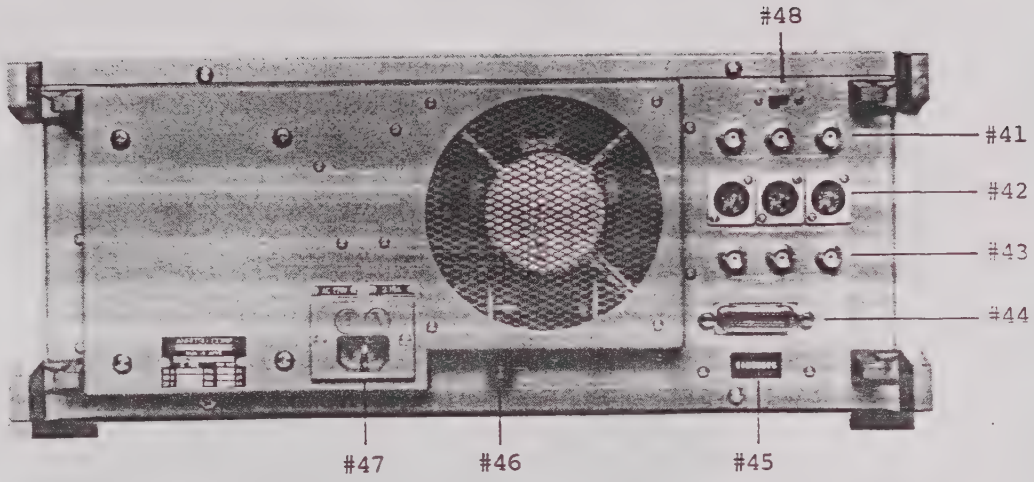


Fig. 3-2 Rear panel

Block name	Operation part		Description
	VIDEO INPUT	#41	Video signal input connector
	SOUND INPUT	#42	Sound signal input connector
	SOUND CARRIER INPUT	#43	Sound subcarrier input connector
	GP-IB	#44	GP-IB connector
	GP-IB address	#45	GP-IB address switch
	⏚	#46	Ground terminal
	Inlet	#47	AC inlet with two fuses. (AC***A, See Note at the beginning of this manual.) Used to connect a power cord. (AC**V)
	VIDEO POLARITY	#48	Selects polarity of VIDEO signal to be connected with VIDEO INPUT as either + (positive polarity) or - (negative polarity).

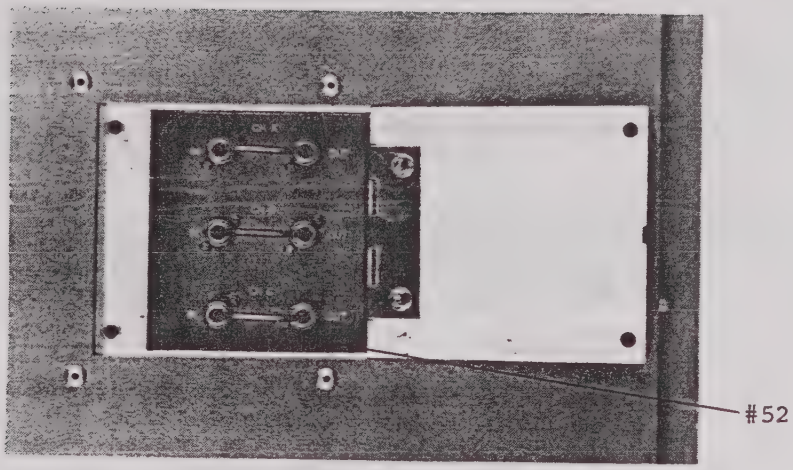


Fig. 3-3(a) Magnified illustration with the door open

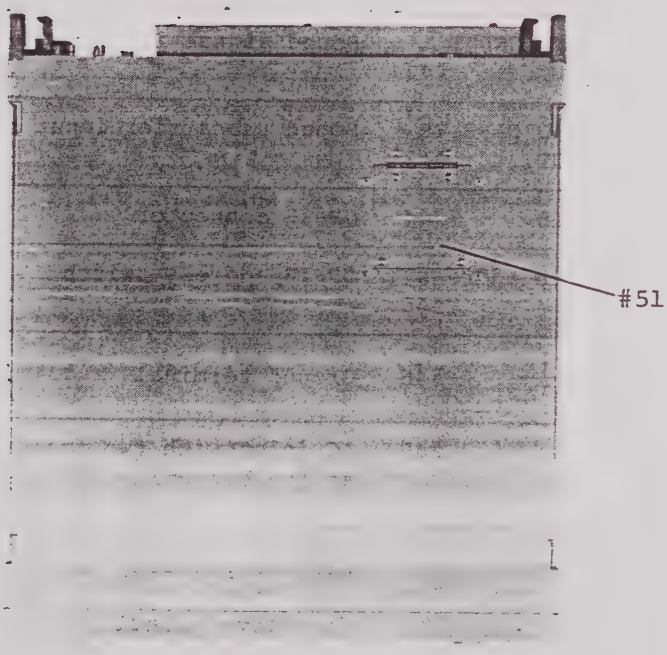


Fig. 3-3(b) Top panel

Note: The MG646A and MG717A only.

Block name	Operation part		Description
EXTERNAL ATTENUATOR #51			Used to set the output level of each channel.
	OUT IN	#52	Remove the U-link, and connect an attenuator between the OUT and IN connectors for each channel.

3.3 Operation Check

(1) Foreword

This rough operation check determines that MG646A/C and MG717A/C are operating normally.

NOTE

Before switching on the power, confirm that the AC LINE voltage is within the appropriate range as described in Section 3.1.

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(2) Turn ON the power supply.

When the power supply is switched ON, the panel status is reset by the internal memory, and the frequency indicator LEDs and the lamps on the OFF/ON keys #4 go on.

If a frequency indicator LED #3 do not go on, press the OFF/ON key #4.

When the frequency indicator LED #3 go on, the highest digit blinks. This is an indication that the frequency is being set. After one or two seconds, once setting is completed, the blinking will stop.

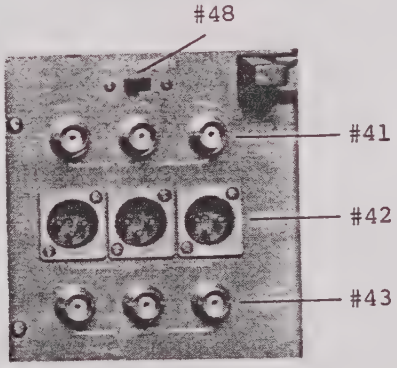
When all digits blink, it is an indication that the built-in memory battery is overcharged, disabling the panel status setting memory.

However, the instrument will function when one of the OFF/ON keys is pressed.

When the above check results have been completed, the instrument is ready to operate.

3.4 Connections of Modulation Signals

When the main carrier output is to be modulated, make the following connections at the rear of the instrument.



(1) Input signal level and types of connectors

Connection at rear panel	Impedance	Input level	Connector
VIDEO INPUT #41	75 Ω	1 Vp-p	BNC
SOUND INPUT #42	600 Ω	0 dBm	XLR
SOUND CARRIER INPUT* #43	75 Ω	0 dBm	BNC

* The SOUND INPUT is for sound in the FM system. However, operation is permitted only when the option 01 is specified.

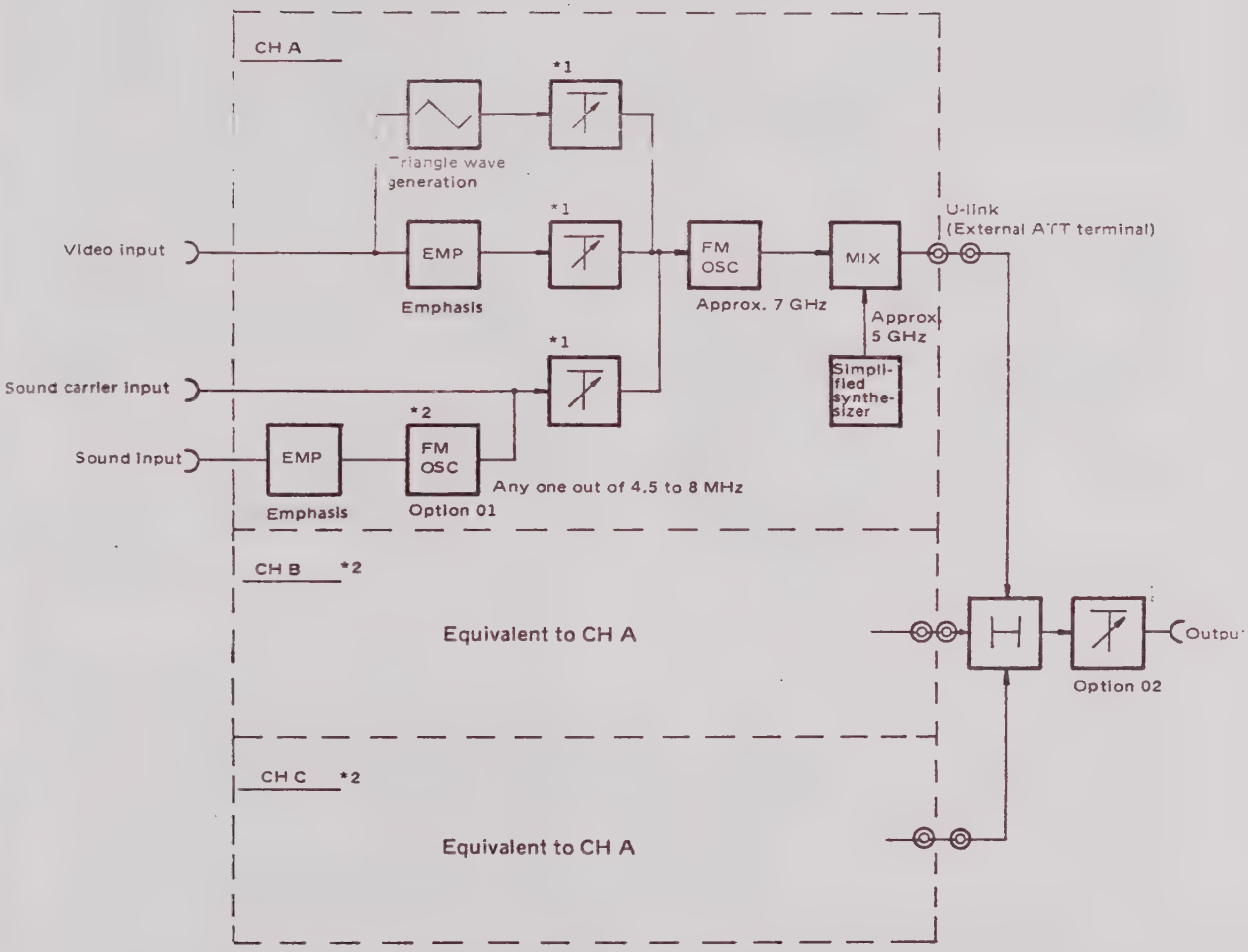
(2) Multi-sound output

For multi-sound output, externally synthesize subcarriers enough for the number of channels required for the sounds, and connect to the SOUND CARRIER INPUT #43 with a synthesized output level of 0 dBm/CH.

When the option 01 of the sound FM system is specified, operation with one of the required number of sound channels as a built-in sound subcarrier and the remaining channels synthesized can be performed.

SECTION 6

BLOCK DIAGRAM



*1: Frequency deviation is the same for all channels.

*2: The MG646C and MG717C do not contain CH B and CH C.

Fig. 6-1 MG646A/C and MG717A/C Basic Block Diagram

SECTION 7

CALIBRATION AND GENERAL MAINTENANCE

7.1 General Maintenance

The general maintenance of the MG646A/C and MG717A/C is basically cleaning and appearance checks.

Item	Time	Operation
External dirt	For long storage	Wipe with neutralized detergent
Dust	When dust is conspicuous after use in a environment	Open the cover and blow dust away with compressed air.
Loose screws	When found	Tighten them with a screwdriver.

7.2 Storage

7.2.1 Precautions on Storage

When storing these instruments for a long period of time, take note on the following points.

(1) Remove the dust before storing.

(2) Avoid storing in places where the temperature may rise above 50°C, where the humidity may be high (more than 90%) or where the temperature may dip below -25°C.

7.3 Calibration

The MG646A/C and MG717A/C have been designed to keep their natural deteriorations to a minimum. However, it is recommended that they be calibrated approximately every six months.

Calibrate according to the service manual (supplied upon request at extra cost), or contact with our service department.

SECTION 8

PERFORMANCE CHECKS

8.1 Introduction

This section describes the measurement conditions, measurement procedures, and test equipment required to check the electrical performances of the MG717A/C and MG646A/C Satellite TV Signal Transmitter satisfy the specifications.

The judgement standards, for whether or not calibration and repair are necessary, in use by the customer are based on the contents of this section.

8.2 Check Items

Table 8-1 Check Item

Item	Specifications	Test Method
1. RF/IF OUTPUT FREQUENCY	Accuracy: within ±100 kHz At 11.7 to 12.75 GHz or 0.9 to 1.7 GHz for A,B and C channels.	Measurement by frequency counter
2. RF/IF OUTPUT LEVEL	MG717A/C: $\geqq$-30 dBm/CH MG646A/C: $\geqq$-20 dBm/CH	Measurement by power meter
3. Spurious response	$\leqq$-55 dBC/11.7 to 12.75 GHz (or 0.9 to 1.7 GHz) $\leqq$-30 dBC/other than the above frequency range -30 dBm/CH or -20 dBm/CH at all CH "ON"	Measurement by spectrum analyzer

Table 8-1 Check Item (Cont'd)

Item	Specifications	Test Method
4. DG	≦2% Test video signal: 4.43 MHz + line signal Deviation (sweep width): ±13.5 MHz VIDEO PRE-EMPHASIS: OFF SOUND CARRIER (INT/EXT): OFF ENERGY DISPERSAL: OFF	Measurement by microwave system analyzer (MSA)
5. DP	≦2% Test video signal: 4.43 MHz + line signal Deviation (sweep width): ±13.5 MHz VIDEO PRE-EMPHASIS: OFF SOUND CARRIER (INT/EXT): OFF ENERGY DISPERSAL: OFF	Measurement by MSA
6. Frequency deviation display accuracy		
(1) VIDEO	Within (±5% + (±200 kHz)) at input level: 1 Vp-p/75 Ω.	Measurement by spectrum analyzer
(2) ENERGY DISPERSAL	Within (±5% + (±200 kHz)) at VIDEO input level: 1 Vp-p/75 Ω.	Measurement by spectrum analyzer
(3) SOUND CARRIER	Within (±5% + (±200 kHz)) at input level: 0 dBm/75 Ω input frequency: 4.5 to 8.5 MHz	

Table 8-1 Check Item (Cont'd)

Item	Specifications	Test Method
7. VIDEO system amplitude characteristics	±0.2 dB/50 Hz to 5 MHz +0.2 dB -0.6 dB/5 to 8 MHz (Reference frequency: 100 kHz PRE-EMPHASIS : OFF) +0.4 dB -1.2 dB/8 to 10 MHz	Measurement by network/spectrum analyzer
8. VIDEO PRE-EMPHASIS accuracy	Within ±0.2 dB for computed slope	Measurement by network/spectrum analyzer
9. Waveform distortion		Measurement by waveform monitor
(1) Field time	≦1.5% The VIDEO signal is the field time wave.	
(2) Line time	≦1.5% The VIDEO signal is the line time wave.	
10. SOUND CARRIER (OPTION 01)		
(1) Frequency accuracy	Within ±2 kHz	Measurement by frequency counter
(2) Frequency deviation accuracy	Within 150 kHzp-p ±5% SOUND input level: 0 dBm/75 Ω, 1 kHz	Measurement by FM linear detector

8.3 Equipment Required for Performance Checks

Table 8-2 Equipment Required for Performance Checks

No.	Equipment	Required Performance	Model
1	POWER METER	Sensor: MA72A (1) Frequency range: 10 MHz to 14 GHz (2) Power measurement range: -20 to +20 dBm (3) Power measurement accuracy: ±0.15 dB/10 MHz to 12.4 GHz, ±0.23 dB/12.4 GHz to 14 GHz (4) Input impedance: 50 Ω Sensor: MA73A (1) Frequency range: 10 MHz to 18 GHz (2) Power measurement range: -60 to -20 dBm (3) Power measurement accuracy: ±0.19 dB/50 MHz to 12.4 GHz, ±0.29 dB/12.4 GHz to 14 GHz (4) Input impedance: 50 Ω	ML83A
2	FREQUENCY COUNTER	(1) Measuring frequency range: 10 Hz to 18 GHz	MF76A
3	SPECTRUM ANALYZER	(1) Frequency range: 10 MHz to 23 GHz	MS710A
4	NETWORK/ SPECTRUM ANALYZER	(1) Frequency range: 10 Hz to 30 MHz (2) Amplitude measurement range: 0 to 100 dB (Resolution: 0.01 dB)	MS420B

Table 8-2 Equipment Required for Performance Checks (Cont'd)

No.	Equipment	Required Performance	Model
5	FM LINEAR DETECTOR	(1) Frequency range : 20 to 550 MHz (2) Measuring range: [illegible] kHz (3) Measuring accuracy: ±5%/each full range	MS57A
6	MICROWAVE SYSTEM ANALYZER (MSA)	(1) Frequency range: 70 ±25 MHz 140 ±50 MHz (2) DG Inherent slope: 0.3%/140 ±20 MHz (3) DP Inherent slope: 0.3°/140 ±20 MHz	ME538K
7	VIDEO SIGNAL GENERATOR	(1) TEST SIGNAL: Field time Line time	MG311B
8	TV WAVEFORM MONITOR	(1) Input level: -20 to +5 dB (1 dB step) (2) Maximum sensitivity: 1%/10 mm Waveform distortion	MW35B
9	SIGNAL GENERATOR	(1) Output frequency: 10.6 to 11.8 GHz 12.0 to 13.0 GHz (2) Output level : -100 to -5 dBm (max. ≧0 dBm)	MG724S1 MG724G1
10	FM DE-MODULATOR	Demodulator or equivalent for FDM2700CH (1) Frequency range: 140 MHz ±15 MHz (2) Input level : +4 dBm (3) DG : 4% (4) DP : 2°	

Table 8-2 Equipment Required for Performance Checks (Cont'd)

No.	Equipment	Required Performance	Model
11	AMPLIFIER	1 GHz band / 12 GHz band	
		(1) Frequency range: 0.900 to 2 GHz / 11.0 to 13.0 GHz	
		(2) Gain: ≧10 dB / ≧20 dB	
		(3) Gain flatness: ±1 dB / ±1 dB	
		(4) 1 dB gain compression: ≧+10 dBm / ≧+10 dBm	
12	ISOLATOR	(1) Frequency range: 11.5 to 12.8 GHz	
		(2) Insertion loss : ≦1 dB	
		(3) Isolation loss : ≦20 dB	
13	MIXER	RHG DM1-18 or equivalent	
14	140 MHz AMPLIFIER	(1) Frequency range: 140 MHz ±30 MHz	
		(2) Gain: ≧30 dB	
		(3) Gain flatness: ≦1 dB	
		(4) 1 dB gain compression: ≧+10 dBm	
		(5) DG (4.43 MHz): ≦0.2%/140 MHz±(13.5 MHz-4.43 MHz)	
		(6) DP (4.43 MHz): ≦0.2°/140 MHz±(13.5 MHz-4.43 MHz)	
15	VIDEO AMPLIFIER	(1) Frequency range: Dc to 10 MHz	
		(2) Amp gain: 30 dB	
		(3) Gain flatness: Within 1 dB	

8.4 Performance Test

8.4.1 IF/RF output frequency

(1) Specifications

Frequency accuracy: ±100 kHz

(2) Setup

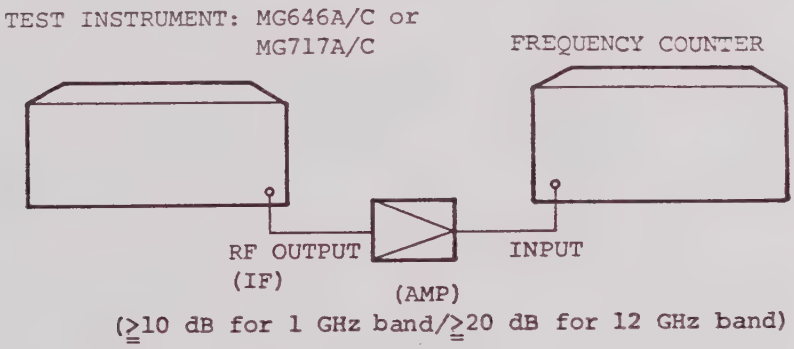


Fig. 8-1 IF/RF Output Frequency Test

(3) Procedures

Step	Procedure
1.	Connect IF OUTPUT of the MG646A/C or RF OUTPUT of the MG717A/C to the input of the AMP (≧10 dB for 1 GHz band/≧20 dB for 12 GHz band) and connect the output of the AMP to the frequency counter.
2.	Set the controls of the MG646A/C or MG717A/C as follows. . CH A/B/C frequency: MG646A/C: 0.9 GHz, 1.3 GHz, 1.7 GHz MG717A/C: 11.7 GHz, 12.2 GHz, 12.75 GHz

(Cont'd)

Step	Procedure
	. CH A ON/OFF: ON . CH B ON/OFF: OFF . CH C ON/OFF: OFF . FM deviation Video : 0 MHzp-p Energy dispersal : 0 MHzp-p Sound carrier : 0 MHzp-p . RF attenuation : 0 dB
3.	Set the frequency counter resolution band to 100 Hz.
4.	Check if the frequency of 3 points is within ±100 kHz.
5.	Next, shift from CH A measurement to CH B. Reset the two following points of item 2: . CH A ON/OFF: OFF . CH B ON/OFF: ON
6.	Check if the frequency of 3 points is within ±100 kHz.
7.	Next, shift from CH B measurement to CH C. Reset the two following points of item 2: . CH B ON/OFF: OFF . CH C ON/OFF: ON
8.	Check if the frequency of 3 points is within ±100 kHz.

8.4.2 IF/RF output level

(1) Specifications

IF output level: ≧-20 dBm/CH (MG646A/C)

RF output level: ≧-30 dBm/CH (MG717A/C)

(2) Setup

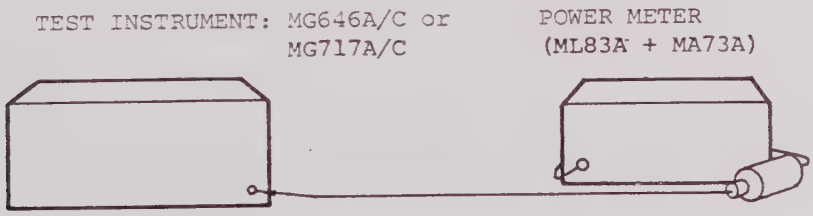


Fig. 8-2 IF/RF Output Level Test

(3) Procedures

Step	Procedure
1.	Connect the power meter sensor to IF OUTPUT of the MG646A/C or RF OUTPUT of the MG717A/C.
2.	Set the controls of the MG646A/C or MG717A/C as follows. . CH A/B/C frequency: MG646A/C: 0.9 GHz, 1.3 GHz, 1.7 GHz MG717A/C: 11.7 GHz, 12.2 GHz, 12.75 GHz . CH A ON/OFF: ON . CH B ON/OFF: OFF . CH C ON/OFF: OFF

(Cont'd)

Step	Procedure

. FM deviation

Video	: 0 MHzp-p
Energy dispersal	: 0 MHzp-p
Sound carrier	: 0 MHzp-p

. IF/RF attenuation : 0 dB

3. Check if -30 dBm (MG717: -20 dBm) or more power is output by adjusting LEVEL ADJ knob at the frequency of 3 points.

4. Next, shift from CH A measurement to CH B. Change the setting of the MG646A or MG717A at the following two points:

   . CH A ON/OFF: OFF
   . CH B ON/OFF: ON

5. Check if -30 dBm (MG717: -20 dBm) or more power is output by adjusting LEVEL ADJ knob at the frequency of 3 points, the same as CH A.

6. Next, shift from CH B measurement to CH C. Change the setting of the MG646A or MG717A at the following two points:

   . CH B ON/OFF: OFF
   . CH C ON/OFF: ON

7. Check if -30 dBm (MG717: -20 dBm) or more power is output by adjusting LEVEL ADJ knob at the frequency of 3 points, the same as CH A.

8.4.3 Spurious response

(1) Specifications

≦-55 dBC/0.9 GHz to 1.7 GHz or 11.7 GHz to 12.75 GHZ

≦-30 dBC/other than the above frequency range

However, output "ON" at all CH at -20 dBm/CH or -30 dBm/CH.

(2) Setup

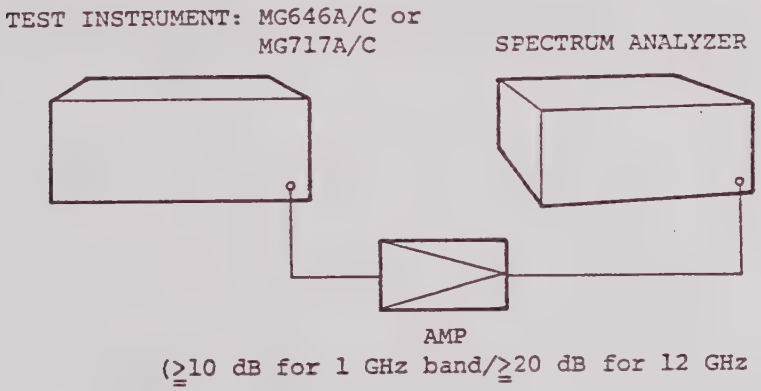


Fig. 8-3 Spurious Response Test

(3) Procedures

Step	Procedure
1.	Connect IF OUTPUT of the MG646A/C or RF OUTPUT of the MG717A/C to the input of the AMP (≧10 dB for 1 GHz band/≧20 dB for 12 GHz band) and connect the output of the AMP to the spectrum analyzer.

(Cont'd)

Step	Procedure

2. Set the controls of the MG646A/C or MG717A/C as follows.

   . CH A frequency:

   MG646A: 0.9800 GHz
   MG717A: 11.9800 GHz

   . CH B frequency:

   MG646A: 1.0000 GHz
   MG717A: 12.0000 GHz

   . CH C frequency

   MG646A: 1.0200 GHz
   MG717A: 12.0300 GHz

   (For MG646C or MG717C, set the frequency to the CH B frequency.)

   . IF/RF output level of each CH:

   MG646A/C: -20 dBm
   MG717A/C: -30 dBm

   . Internal Sound Carrier: OFF

Note

Do not connect a signal to Video Input or Sound Carrier Input on the rear panel.

3. Using the spectrum analyzer, check that the nearby spurious response (±5 MHz for 12 GHz/1.0 GHz carrier) is -55 dBC or less.

(Cont'd)

Step	Procedure
4.	Disconnect the AMP and connect IF OUTPUT of the MG646A/C or RF OUTPUT of the MG717A/C directly to the spectrum analyzer.
5.	Check if the spurious response is 55 dBC or less in the 1 GHz ±50 MHz or 12 GHz ±50 MHz range.
6.	Measure the spurious response outside the 0.9 GHz to 1.7 GHz or 11.7 GHz to 12.75 GHz range and check if it is -30 dBC or less.

8.4.4 Differential gain/differential phase (DG/DP)

(1) Specifications

DG: $\leqq$2%/±13.5 MHz

DP: $\leqq$2°/±13.5 MHz

(2) Setup

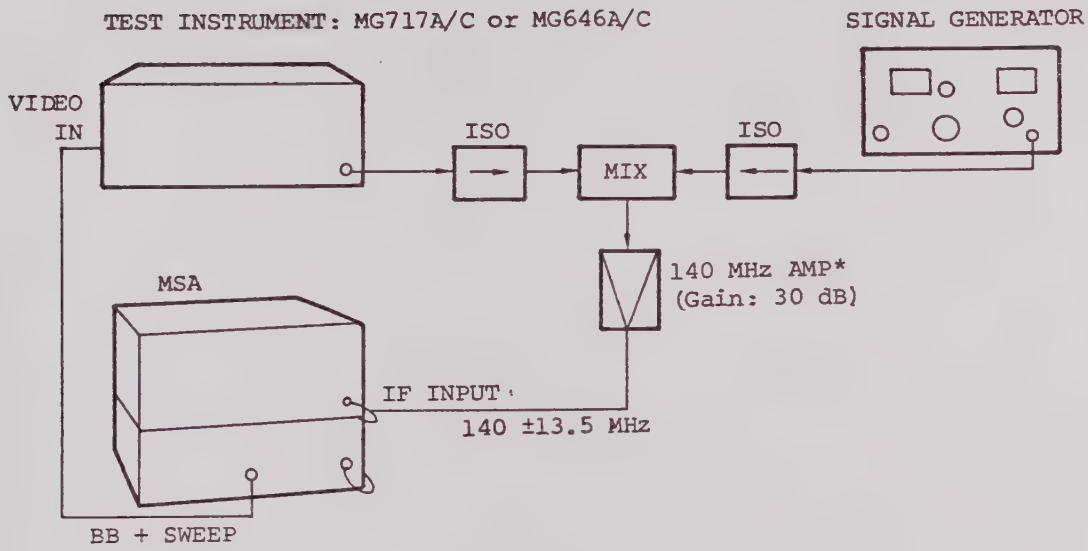


Fig. 8-4 DG/DP Test

(3) Procedures

Step	Procedure
1.	Connect the MG646A/C or MG717A/C to the MSA (ME538K) and signal generator (MG724A1/G1/S1 or MG655A) as shown in Fig. 8-4.
2.	Set the controls of the MG646A/C or MG717A/C as follows. . CH A/B/C frequency: MG646A/C: 0.9 GHz, 1.3 GHz, 1.7 GHz MG717A/C: 11.7 GHz, 12.2 GHz, 12.75 GHz . CH A ON/OFF: ON . CH B ON/OFF: OFF . CH C ON/OFF: OFF . IF/RF output level: -20 dBm/-30 dBm . Video pre-emphasis: OFF . Internal sound carrier: OFF . FM deviation video: 25.0 MHzp-p Note Do not connect anything to SOUND CARRIER Input on the rear panel.

(Cont'd)

Step	Procedure
3.	Set the controls of the signal generator as follows.
	. 0.9 GHz measurement : Set the MG655A to 760 MHz.
	. 1.3 GHz measurement : Set the MG655A to 1.160 GHz.
	. 1.7 GHz measurement : Set the MG724A1 to 1.840 GHz.
	. 11.7 GHz measurement : Set the MG724S1 to 11.56 GHz.
	. 12.2 GHz measurement : Set the MG724G1 to 12.06 GHz.
	. 12.75 GHz measurement: Set the MG724G1 to 12.61 GHz.
	. Output level: Set to maximum
4.	Set the controls of the MSA transmitter as follows.
	. Transmitter mode: BB
	. BB output level : -20 dBm
	. Sweep output voltage: 0.54 Vp/75 Ω
	. Output mode : BB + SWEEP
	. BB frequency : 4.43 MHz
	. Sweep frequency : LINE
5.	Set the controls of the MSA receiver as follows.
	. Receiver mode : IF
	. IF band : 140 MHz
	. Range mode : AUTO
	. Freq Select : MARKER
	. Marker mode : SLIDE (set to ±9.07 MHz)
	. Y1 function : DG
	. Y2 function : DP

(Cont'd)

Step	Procedure
6.	While watching the marker image on the CRT of the MSA receiver, check if the center marker image is at the center of the CRT. (If it is not at the center, adjust the MG724 frequency.)
7.	While watching the MSA receiver marker image, check if a side marker image is visible at both sides (when the side marker image is not visible, adjust the MSA transmitter sweep output voltage) and read the side marker width DG and DP image values.
8.	Check if DG/DP at 3 frequencies satisfy the specifications.
9.	Check the CH B and CH C in the same way as the CH A.

8.4.5 Frequency deviation display accuracy

(1) Specifications

Common for VIDEO, ENERGY DISPERSAL, and SOUND CARRIER.

Within (±5% + (±200 kHz))

Input level conditions

VIDEO: 1 Vp-p/75 Ω (VIDEO signal)
ENERGY DISPERAL: 1 Vp-p/75 Ω (VIDEO signal)
SOUND CARRIER: 0 dBm/75 Ω

(2) Setup

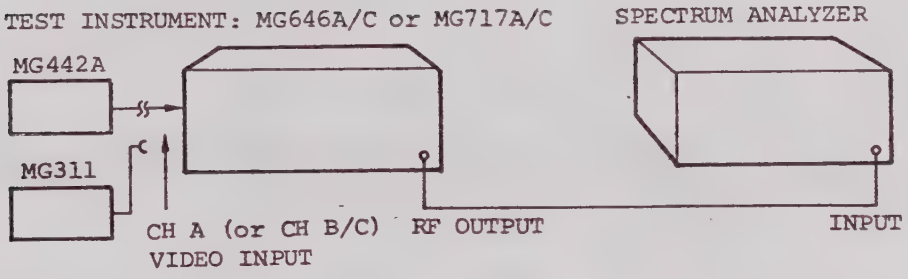


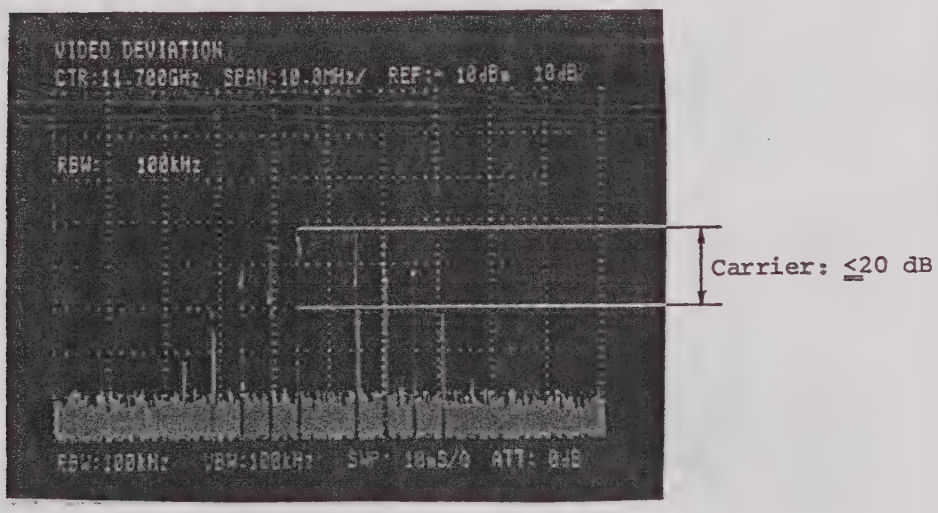
Fig. 8-5 Frequency Deviation Display Accuracy Test

(3) Procedures

Step	Procedure
1.	Connect IF OUTPUT of the MG646A/C or RF OUTPUT of the MG717A/C to INPUT of the spectrum analyzer MS710A.
2.	Set the controls of the MG646A/C or MG717A/C as follows. . CH A/B/C output: ON . CH A/B/C frequency: Arbitrary (Set CH A/B/C to different frequency respectively. However, the frequency difference among each CH should be more than 20 MHz.) . FM deviation video: 20 MHzp-p . Energy dispersal : 0 MHzp-p . Internal sound carrier: OFF

(Cont'd)

Step	Procedure
3.	Set the MG442A output to 5.21 MHz, +2.2 dBm/75 Ω (1 Vp-p/75 Ω equivalent)
4.	Monitor the spectrum image with the MS710A and check if it becomes "carrier zero" modulation.

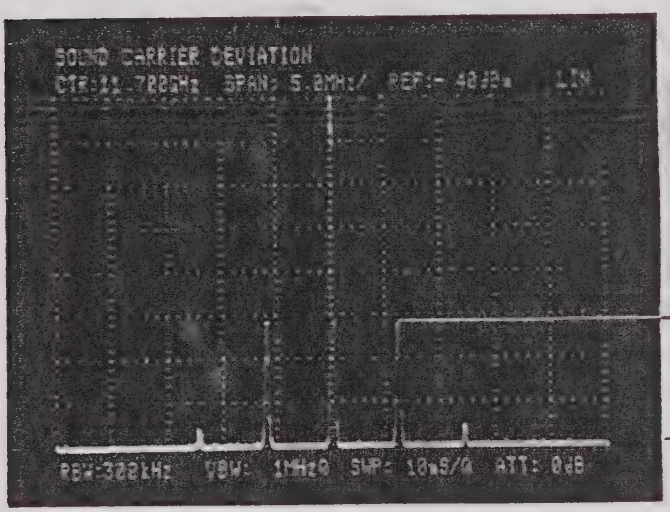


5.	Connect the MG311B in place of the MG422A and set the MG311B output level to "0 dBm."
6.	Change the MG717 settings as follows: . FM deviation video : 0 MHzp-p . FM deviation energy dispersal: 1 MHzp-p
7.	Read the spectrum width from the MS710A. Check if the read value satisfies the energy dispersal specification.
8.	Connect the MG422A to the SC Input, set the MG422A frequency to 6 MHz, and set the output level to 0 dBm.

(Cont'd)

Step	Procedure

9. Monitor the spectrum with the MS710A, set scale to the LINE state, set the carrier to 8 divisions full scale, and check if the 6 MHz sideband is 2.84 divisions as shown below.



10. Check the CH B and CH C in the same way as the CH A (MG646A or MG717A only.)

8.4.6 Video band amplitude characteristics

(1) Specifications

$\leqq \pm 0.2$ dB/50 Hz to 5 MHz

$\leqq \begin{matrix} +0.2 \text{ dB} \\ -0.6 \text{ dB} \end{matrix}$/5 to 8 MHz

$\leqq \begin{matrix} +1 \text{ dB} \\ -1.2 \text{ dB} \end{matrix}$/8 to 10 MHz

Note: Reference frequency: 100 kHz

(2) Setup

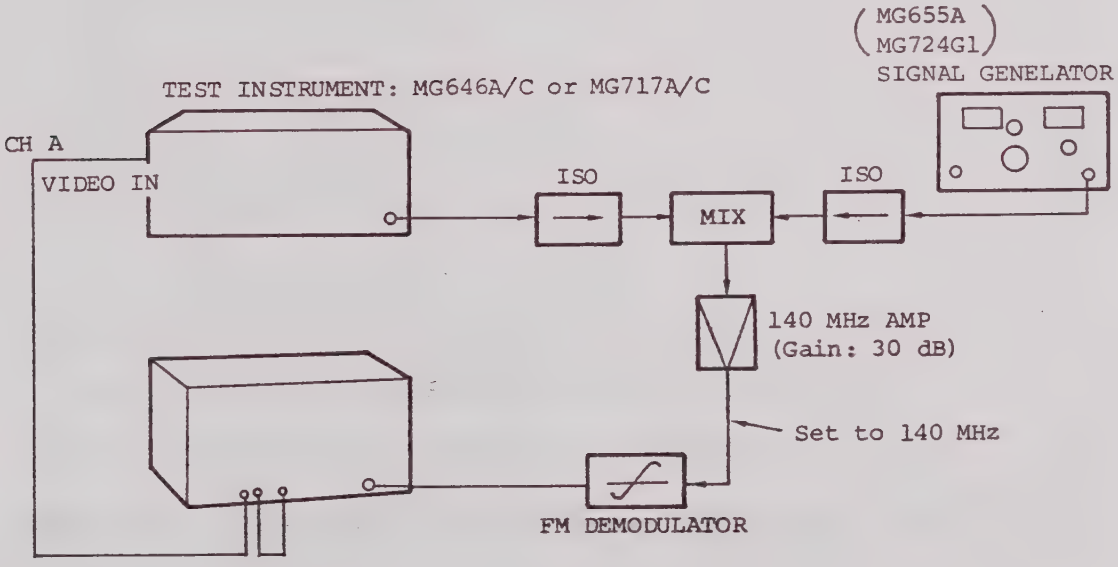


Fig. 8-6 Video Band Amplitude Characteristics Test

(3) Procedures

Step	Procedure
1.	Connect IF OUTPUT of the MG646A/C or RF OUTPUT of the MG717A/C to the network/spectrum analyzer MS420B and signal generator (MG655A or MG724G1) as shown in Fig. 8-6.
2.	Set the controls of the MG646A/C or MG717A/C as follows. . CH A/B/C frequency: MG646A/C: 1.3 GHz MG717A/C: 12.2 GHz . CH A output : ON . CH B/C output: OFF . FM deviation video : 17 MHzp-p . Energy dispersal : OFF . Internal sound carrier: OFF . FM deviation sound carrier : 0 MHzp-p
3.	When measuring the MG646A/C, set the signal generator (MG655A) to 1.16 GHz.
4.	When measuring the MG717A/C, set the signal generator (MG724G1) to 12.06 GHz.
5.	Using the MS420B, check if the amplitude characteristic satisfies the specifications.
6.	Check the CH B and CH C in the same way as the CH A (MG646A or MG717A only.)

8.4.7 Video pre-emphasis slope accuracy

(1) Specifications

$\leqq \pm 0.2$ dB/for computed slope

(2) Setup

Same as Fig. 8-6.

(3) Procedures

Measure with the same procedures as paragraph 8.4.6 (3). Set the MG646A/C or MG717A/C Video pre-emphasis to A or B.

Table 8-3 Computed Slope

Frequency (MHz)	Curve A	Curve B
0.2	-6.91 (dB)	-9.58 (dB)
0.3	-4.95	-8.33
0.5	-2.12	-5.92
* 0.7616	0.0	-3.52
** 1.512	+2.21	0.0
2.0	+2.68	+1.01
3.0	+3.06	+1.98
5.0	+3.28	+2.59
10.0	+3.37	+2.88

* Curve A standard frequency (Gain: 0 dB)

** Curve B standard frequency (Gain: 0 dB)

8.4.8 Waveform distortion

(1) Specifications

. FIELD TIME $\leqq$1.5%
. LINE TIME $\leqq$1.5%

Note: Field time wave and line time wave connected, respectively.

(2) Setup

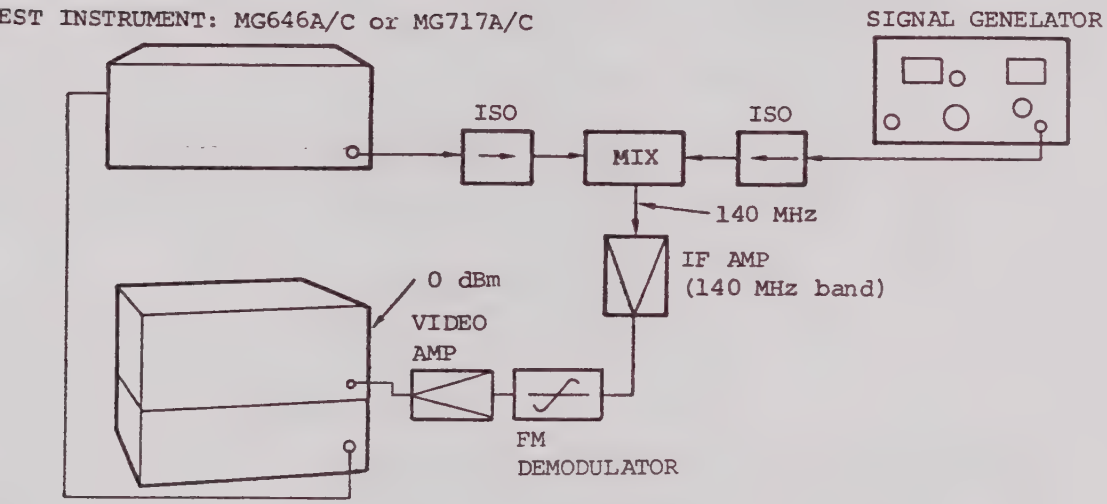


Fig. 8-7 Waveform Distortion Test

(3) Procedures

Step	Procedure
1.	Connect the video signal generator MG311B, waveform monitor MW35B, and MG724G1/S1 to the MG646A/C or MG717A/C as shown in Fig. 8-7.

(Cont'd)

Step	Procedure

2. Set the controls of the MG646A/C or MG717A/C as follows.

   . CH A/B/C frequency:

   MG646A/C: 1.3 GHz
   MG717A/C: 12.2 GHz

   . CH A output : ON

   . CH B/C output : OFF

   . Video pre-emphasis : OFF

   . Energy dispersal : OFF

   . Internal sound carrier: OFF

3. Set the MG724G1/S1 frequency to 12.06 GHz and set the output level to MAX.

< FIELD TIME check >

4. Set the controls of the MG311B as follows.

   . Field time : ON

   . Subcarrier : INT

   . Vertical sync : ON

   . Output level : 0 dBm

5. Set the controls of the MW35B as follows.

   . Field time : ON

   . Mode : MEASURE

   . Int sync : ON

   . Expand : OFF

(Cont'd)

Step	Procedure
6.	Adjust DC OFFSET so that an image appears on the MW35B screen.
7.	Adjust INPUT LEVEL so that the image on the MW35B screen is set to full scale.
8.	Set EXPAND of the MW35B to ON and set DC OFF SET so that an image appears on the screen. Read the division of the waves of the waveform at this time. (At EXPAND ON, it becomes 1%/DIV.)
9.	Check if the read value satisfies the specifications.
< LINE TIME check >	
10.	Reset the MG311B and MW35B waveform from FIELD TIME to LINE TIME.
11.	Perform measurement the same as in steps 6 to 9 and check.
12.	Check the CH B and CH C in the same way as the CH A. (MG646A or MG717A only.)

8.4.9 Sound carrier (Option 01)

(1) Specifications

. Frequency accuracy : $\leqq \pm 2$ kHz

. Frequency deviation accuracy: 150 kHzp-p ±5%

(2) Setup

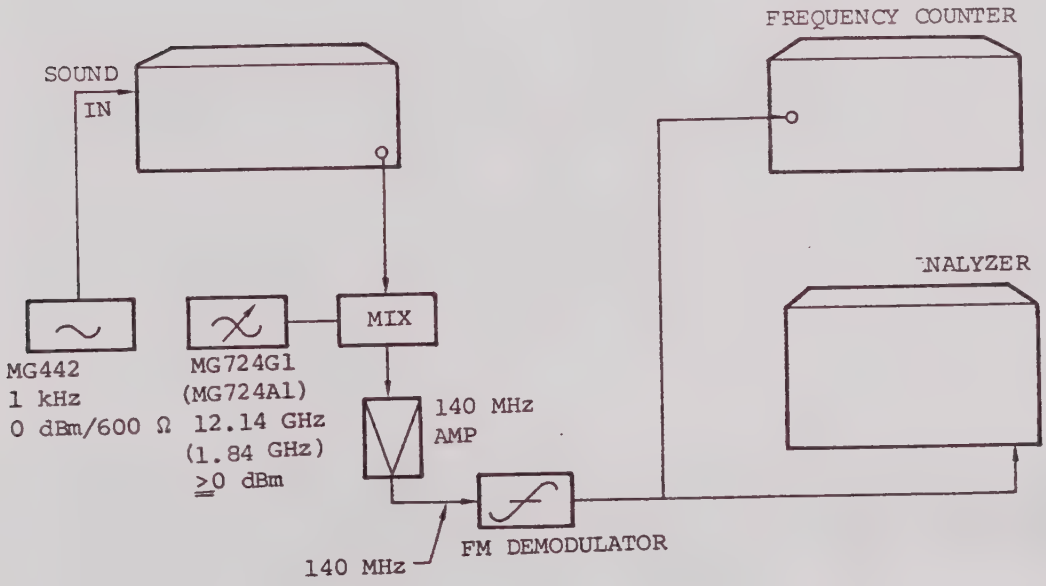


Fig. 8-8 Sound Carrier Test

(3) Procedures

Step	Procedure
1.	Connect IF OUTPUT of the MG646A/C or RF OUTPUT of the MG717A/C to the frequency counter MF76A and spectrum analyzer MS611A as shown in Fig. 8-8.

(Cont'd)

Step	Procedure
2.	Set the controls of the MG646A/C or MG717A/C as follows. . CH A/B/C frequency: 12.14 GHz (1.84 GHz) . CH A output ON/OFF: ON . CH B output ON/OFF: OFF . CH C output ON/OFF : OFF . FM deviation Video : 0 MHzp-p Energy dispersal : 0 MHzp-p Sound carrier : 8.0 MHzp-p . Internal sound carrier: ON . Video Pre-emphasis : OFF . RF attenuation : 0 dB
3.	Set the MG442A output to OFF and measure the CH A sound carrier frequency with the frequency counter.
4.	Next, shift from CH A measurement to CH B. Change the MG717A/C (MG646A/C) settings at the following two points: . CH A output: OFF . CH B output: ON
5.	Measure the CH B sound carrier frequency with the frequency counter.

(Cont'd)

Step	Procedure
6.	Next, shift from CH B measurement to CH C. Change the MG717A/C (MG646A/C) settings at the following two points: . CH B output: OFF . CH C output: ON
7.	Measure the CH C sound carrier frequency with the frequency counter.
8.	Set the MG442A output to ON and connect to the CH C SOUND INPUT. Connect the FM DEMODULATION output to the spectrum analyzer, monitor the SOUND CARRIER spectrum, and check if the spectrum width is 150 kHzp-p.
9.	Next, connect the MG442A to the CH B SOUND INPUT. Change the MG717A/C (MG646A/C) settings at the following two points: . CH C output: OFF . CH B output: ON
10.	Observe the sound carrier spectrum and check if the spectrum width is 150 kHzp-p, the same as for CH A.
11.	Next, connect the MG442A to the CH A SOUND INPUT. Change the MG717A/C (MG646A/C) settings at the following two points: . CH B output: OFF . CH A output: ON
12.	Monitor the sound carrier spectrum and check if the spectrum width is 150 kHzp-p, the same as for CH A.

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